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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/760,022	01/19/2004	Michio Koike	15.77/4159	8517

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KONRAD RAYNES & VICTOR, LLP
315 S. BEVERLY DRIVE
210
BEVERLY HILLS, CA 90212

EXAMINER	
ORTIZ, EDGARDO	

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/760,022	KOIKE ET AL.	
	Examiner	Art Unit	
	Edgardo Ortiz	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *2,6,8,10,12-16,19 and 20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-5,7,9 and 11* is/are rejected.

7)☒ Claim(s) *17 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/178,875.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1, 3-5, 7, 9, 11 and 17-18 in the reply filed on January 24, 2005 is acknowledged. The traversal is on the ground(s) that the examiner has not established that it would be an undue burden for the examiner to examine all of the pending claims. This is not found persuasive because as stated in the restriction requirement, the application contains claims directed to patentably distinct species of the claimed invention.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu (U.S. Patent No. 6,107,105) in view of Mathews (U.S. Patent No. 6,211,078). With regard to Claim 1, Sandhu discloses a method for manufacturing a semiconductor device comprising:

forming (column 2, lines 45-48) a first electrode (13) above a semiconductor substrate (10);

forming (column 3, lines 1-10) a dielectric material (14) on the first electrode;

forming (column 3, lines 11-13) a second electrode (15) on the dielectric material;

wherein the forming the first electrode and the forming the second electrode are controlled so that at least one of the first electrode (13) and the second electrode are formed from a material comprising titanium nitride (column 2, lines 45-48) containing oxygen atoms (column 2, lines 60-67). Also see figure 1.

Sandhu fails to disclose that the step of providing the claimed titanium nitride containing oxygen atoms including an amount of oxygen atoms within a range of from 5 to 25 atomic %. However, Mathews discloses a method of improving resist adhesion for use in patterning conductive layers, wherein a titanium nitride layer (16) includes an oxidized region (18) with a concentration of oxygen atoms in a range of about 20 percent to about 60 percent (column 5, lines 14-20). The claimed range overlaps the range disclosed by Mathews and thus the reference clearly suggests the claimed oxygen atoms concentration. Also see figures 1-3.

Therefore, it would have been obvious to someone with ordinary skill in the art, at the time of the invention, to modify the method as disclosed by Sandhu to include the claimed titanium nitride containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to 25 atomic %, as suggested by Mathews, in order to promote the adhesion of a photoresist layer and improve the patterning of a conductive layer under the titanium nitride layer (column 6, lines 57-59).

With regard to Claim 3, Sandhu discloses a forming (column 3, lines 1-10) a dielectric material (14) so that the first electrode (13) is positioned between the dielectric material (14) and a

semiconductor substrate (10). Sandhu fails to disclose that second electrode is made from a material comprising titanium nitride and the step of providing the claimed titanium nitride containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to 25 atomic %. However, and regarding the claimed second electrode made from a material comprising titanium nitride, it is noted that such a modification would have been obvious to someone with ordinary skill in the art, since titanium nitride is an used and well-known material in the semiconductor art for use as an electrode for a capacitor structure. Regarding the claimed step of providing the claimed titanium nitride containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to 25 atomic %.

Mathews discloses a method of improving resist adhesion for use in patterning conductive layers, wherein a titanium nitride layer (16) includes an oxidized region (18) with a concentration of oxygen atoms in a range of about 20 percent to about 60 percent (column 5, lines 14-20). The claimed range overlaps the range disclosed by Mathews and thus the reference clearly suggests the claimed oxygen atoms concentration. Also see figures 1-3.

Therefore, it would have been obvious to someone with ordinary skill in the art, at the time of the invention, to modify the method as disclosed by Sandhu to include the claimed titanium nitride containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to 25 atomic %, as suggested by Mathews, in order to promote the adhesion of a photoresist layer and improve the patterning of a conductive layer under the titanium nitride layer (column 6, lines 57-59).

Claims 4, 5, 7, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suga (U.S. Patent No. 5,698,463) in view of Mathews (U.S. Patent No. 6,211,078). With regard to Claim 4, Suga discloses a method for manufacturing a semiconductor device comprising:

forming (column 5, lines 34-35) an insulating layer (26) above a semiconductor substrate (21);

forming (column 5, lines 35-37) a conducting region (25n or 25p) above the insulating layer, the conducting region consisting of a gate electrode (column 5, line 36);

forming (column 5, lines 40-41) a dielectric layer (27) above the conducting region;

forming (column 5, lines 37-39) an electrode (25c) for a capacitive element above the dielectric layer (27); and

forming (column 5, lines 58-63) an out-going electrode (28c) connected to the electrode for the capacitive element (see figure 3).

Suga fails to disclose that the step of providing the claimed film comprising titanium nitride containing oxygen atoms including an amount of oxygen atoms within a range of from 5 to 25 atomic %. However, Mathews discloses a method of improving resist adhesion for use in patterning conductive layers, wherein a titanium nitride layer (16) includes an oxidized region (18) with a concentration of oxygen atoms in a range of about 20 percent to about 60 percent (column 5, lines 14-20). The claimed range overlaps the range disclosed by Mathews and thus the reference clearly suggests the claimed oxygen atoms concentration. Also see figures 1-3.

Therefore, it would have been obvious to someone with ordinary skill in the art, at the time of the invention, to modify the method as disclosed by Suga to include the claimed titanium nitride containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to 25 atomic %, as suggested by Mathews, in order to promote the adhesion of a photoresist layer and improve the patterning of a conductive layer under the titanium nitride layer (column 6, lines 57-59).

With regard to Claim 5, Suga discloses forming (column 5, lines 58-63) an out-going electrode (28c) that extends above the electrode for the capacitive element (see figure 3).

With regard to Claim 7, a further difference between the claimed invention and Suga is, the claimed film comprising titanium nitride containing oxygen atoms formed by depositing a TiN layer by sputtering and injecting oxygen ions into the sputtered TiN layer. However, Mathews discloses a method of improving resist adhesion for use in patterning conductive layers, wherein a titanium nitride layer (16) is formed by sputtering (column 3, lines 52-64) and includes an oxidized region (18) formed by oxidizing the titanium nitride layer in a plasma under an applied electric field that enhances the migration of atomic oxygen toward the titanium nitride layer (column 4, lines 63-67).

Therefore, it would have been obvious to someone with ordinary skill in the art, at the time of the invention, to modify the method as disclosed by Sandhu to include the claimed film comprising titanium nitride containing oxygen atoms formed by depositing a TiN layer by sputtering and

injecting oxygen ions into the sputtered TiN layer, as suggested by Mathews, in order to increase the oxide growth rate at a low temperature (column 4, lines 63-64).

With regard to Claim 9, a further difference between the claimed invention and Suga is, the claimed film comprising titanium nitride containing oxygen atoms formed by depositing a TiN layer by sputtering and oxidizing the sputtered TiN layer. However, Mathews discloses a method of improving resist adhesion for use in patterning conductive layers, wherein a titanium nitride layer (16) is formed by sputtering (column 3, lines 52-64) and includes an oxidized region (18) formed by oxidizing the sputtered TiN layer (column 4, lines 15-18).

Therefore, it would have been obvious to someone with ordinary skill in the art, at the time of the invention, to modify the method as disclosed by Suga to include the claimed film comprising titanium nitride containing oxygen atoms formed by depositing a TiN layer by sputtering and oxidizing the sputtered TiN layer, as suggested by Mathews, in order to promote the adhesion of a photoresist layer and improve the patterning of a conductive layer under the titanium nitride layer (column 6, lines 57-59).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suga (U.S. Patent No. 5,698,463) in view of Mathews (U.S. Patent No. 6,211,078) and further in view of Ngan et al. (U.S. Patent No. 5,378,660). With regard to Claim 11, Suga and Mathews essentially disclose the claimed invention but fail to disclose the claimed titanium nitride film containing oxygen atoms formed by sputtering with Ti as target in an atmosphere comprising oxygen gas and nitrogen gas.

However, Ngan discloses sputtering a titanium layer (column 2, lines 37-40) and processed in an atmosphere of nitrogen and oxygen to form an oxygen-containing titanium nitride layer (column 2, lines 54-59).

Therefore, it would have been obvious to someone with ordinary skill in the art, at the time of the invention, to modify the method as disclosed by Suga to include the claimed titanium nitride film containing oxygen atoms formed by sputtering with Ti as target in an atmosphere comprising oxygen gas and nitrogen gas, as suggested by Ngan, in order improve barrier properties (column 2, lines 59-60).

Allowable Subject Matter

3. Claims 17 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The cited prior art fails to disclose, teach or suggest, the claimed steps of "*forming at least one of a resistance element and a fuse element, wherein the electrode for the capacitive element has the same composition as that of that the at least one of a resistance element and a fuse element*" and "*forming the electrode for the capacitive element is simultaneously with the one of a resistance element and a fuse element.*"

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edgardo Ortiz whose telephone number is 571-272-1735. The examiner can normally be reached on Monday-Friday (1st Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

E.O.
A.U. 2815
4/14/05

Tom Thomas
TOM THOMAS
SUPERVISORY PATENT EXAMINER